Glass bangles of al-Shihr, Hadramawt (fourteenth-nineteenth centuries), a corpus of new data for the understanding of glass bangle manufacture in Yemen

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Stéphanie Boulogne & Claire Hardy-Guilbert

Summary
This article on glass bangles from al-Shiḥr, Ḥaḍramawt, presents a corpus of new data (fourteenth–nineteenth centuries) leading to an understanding of the manufacture of glass bangles in Yemen. The paper discusses the case for local production versus glass imports in south Yemen, using archaeological, textual, and ethnographic data to support the argument. This is the result of a glass study made in October 2007 at al-Shiḥr.

Keywords: glass bangles, al-Shiḥr, Ḥaḍramawt, imports, local manufacture

Introduction

Al-Shiḥr (Fig. 1) is mentioned as a well-known harbour of medieval and later Yemen in texts such as Sulaymān al-Mahrī b. Aḥmad b. Sulaymān's (1480–1550), *Al-ᶜumdah al-mahriyyah fī ḍabt al-ᶜulūm al-baḥriyyah*.

Investigations undertaken between 1995 and 2002, and in 2007, under the direction of C. Hardy-Guilbert (CNRS, Paris) (Hardy-Guilbert 2007), have produced an interesting corpus of ceramic and glass that mixes imports from Iran, Iraq, Asia, Africa, and India with local Yemeni manufactured material (Hardy-Guilbert 2002: 39–53). The investigations focused on material from Tell al-Qaryah, one of the ancient quarters of the city, 60 m from the shoreline. As a result, fifteen levels of occupation were defined, dating from *c.* AD 780 to 1996,[1] which could be identified with ten phases.[2] In the 2007 season, a full study of the large corpus of glass from the 1996–2002 excavations was made. We registered several samples of decorated vessels, as well as undecorated glass and many coloured bangles: a total of about 500 bangle fragments, from which we selected 185 in good condition for closer study. The corpus is generally later than the fourteenth century. Glass bangles have also been discovered in Kawd am-Saylāᵓ, around the seventeenth century in the Gulf of Aden, 600 km from al-Shiḥr (Monod 1978: 110–124), as well as in India, the Near East, and the Red Sea region.

This article intends to demonstrate how the study of al-Shiḥr bangles is important for the understanding of glass manufacture in Arabia. The paper is in three parts: the first is on the archaeological corpus; the second provides comparative data on styles and techniques; and the third focuses on the question of local production versus the importation of glass.

[1] APIM (Atlas des Ports et Itinéraires Maritimes de l'Islam Médiéval) resources.

[2] From Phase 1, the first occupation (to 4.30 m), to Phase 4, the fill of the last Abbasid structures (i.e. eighth century to the beginning of the thirteenth century), no glass bangle was recovered. Phase 5 is an open-air platform (from 6.30/6.50 to 7.00) on which huts were erected and numerous pits and ovens containing deposits of ash and fish bones were found. These structures are included inside a thick layer of ash (0.50 m thick) clearly visible throughout Tell al-Qaryah. Mustard ware and late sgraffiati associated with Longquan stoneware were found, datable to between the latter half of the thirteenth and the first half of the fourteenth century. Phase 6 (fifteenth century) is a domestic occupation of mud-brick and stone houses based on earthen floors (from 7.30 m) with other types of Tihāmah ceramics that replaced Mustard ware and with blue and white Chinese porcelain. During Phase 7 (sixteenth century) a level of mud-brick houses was built with wall foundations of stone. A glass workshop (from 7.90 m) with its hearth and crucibles (SHR 99 2345–2) belongs to this phase. In Phase 8 (seventeenth century) a part of the site was abandoned, but mud-brick dwelling rooms were built in the southern area associated with Haysī ceramics and Persian cups in frit ware imitating Chinese porcelain. At the end of the eighteenth or in the nineteenth century, during Phase 9, stone houses stood on the top of the tell. They were already destroyed when the site was discovered in 1995; a surface deposit 1 m thick, cut into by rubbish pits down to the level of Phase 8, belongs to Phase 9. In Phase 10 (twentieth century) part of the site was covered by a platform for drying fish, made of a thick layer of mud and fish oil above a bed of pebbles (from 8.95/9.10 m).

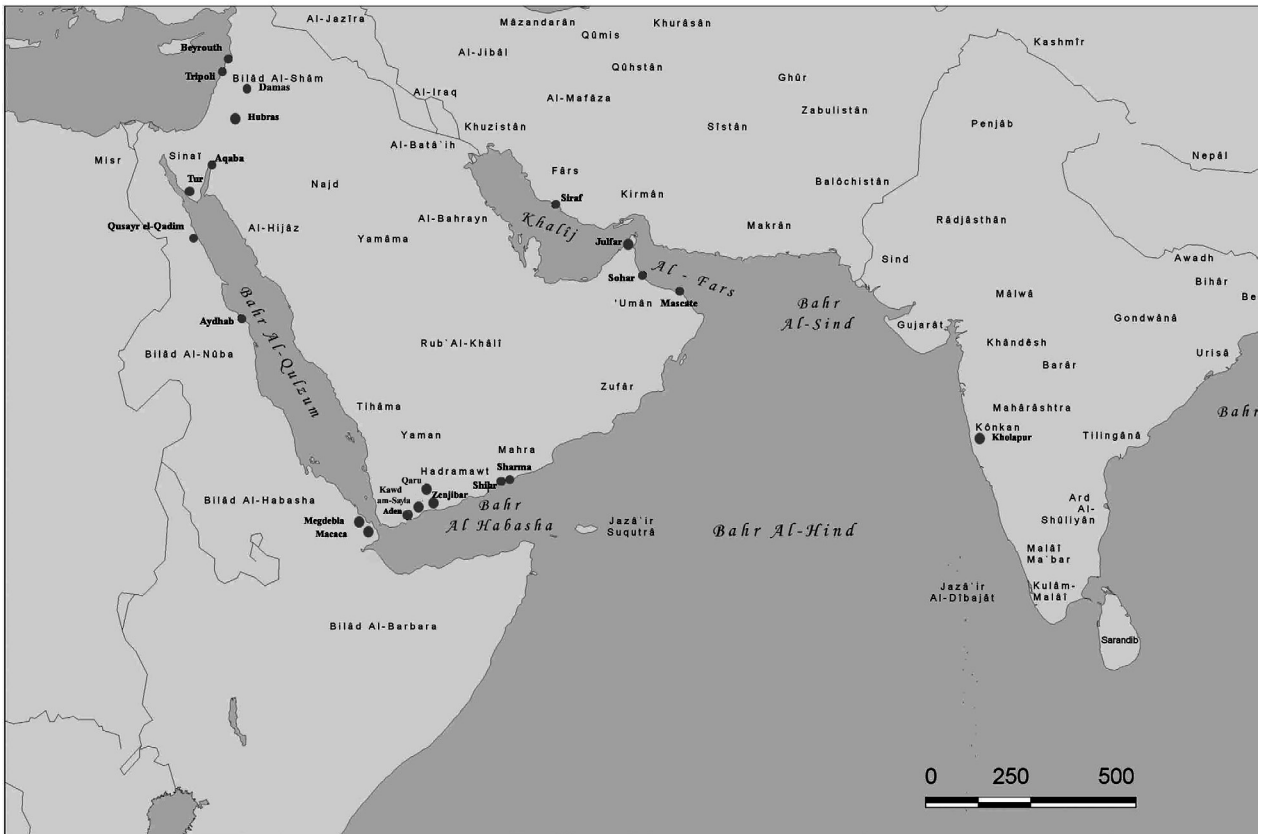

Figure 1. *A map of the location of al-Shiḥr.*

The archaeological corpus

This chapter introduces the contextual archaeological data and the material used to develop a classification.

Archaeological levels and the classification used (Figs 2 and 3)

Glass bangles were recovered only in the southern part of the tell (the site under investigation) and often from levels that also contained numerous ceramic sherds. The bangles were never found below 7.00 m, which is above the layer of ash that has been dated to the fourteenth century. The only exception was SHR 99 2301, which was found in the latest level (to 6.88/6.77 m) in test trench G52.

The classification that we used separates polychrome and monochrome bangles, as is normally done in the analysis of Indian bangles (see Sankalia & Dikshit 1952: 115–118; Dikshit 1969: 69–71) and sometimes of Near Eastern coloured bracelets (Shindo 1996; 2009). By using this methodology, polychrome (57%) and monochrome (43%) glass types were identified, among which were several sub-groups. Generally each sub-group includes many of the same type of bangles and some single unique specimens.

The polychrome bangles (Figs 4 & 5)

Polychrome bangles (105 samples) make up 57% of the finds. Of this group, 85% (ninety samples) can be grouped into six patterns with similar designs, while only 14% are of a unique pattern. They are nearly all made of light or

a. Monochrome and polychrome bangles	
Polychrome	57%
Monochrome	43%
b. Polychrome bangles	
In batches	85%
Others	15%
c. Monochromes bangles	
In batches: plain green	89%
Others	11%

Figure 2. *Classification table.*

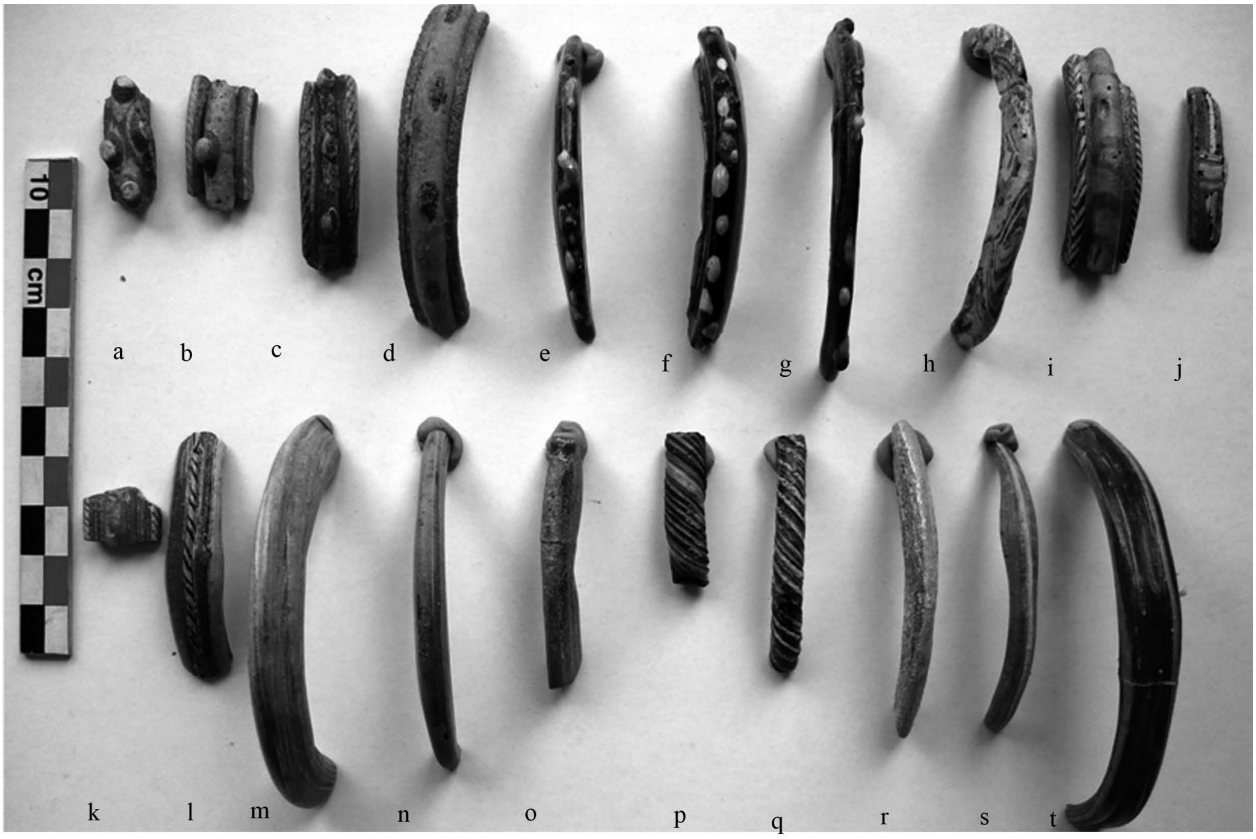

Figure 3. *The polychrome bangles: an overview.*
a. *SHR 97 2079-1: L 2.7 cm, W 1 cm; green core, coloured layers, flowers decoration, half flat section;* **b.** *SHR 99 2321-1: L 2.5 cm, W 1.2 cm; green core, coloured layers, prunts decoration, flat section;* **c.** *SHR 99 2370-1: L 3.6 cm, W 1 cm; green core, yellow layers, prunts decoration, flat section;* **d.** *SHR 97 2064-1: L 6.3 cm, W 1 cm; green core, coloured layers, prunts decoration, flat section;* **e.** *SHR 97 2068-1: L 5.9 cm, W 0.8 cm; green core, coloured layers, prunts decoration, triangular section;* **f.** *SHR 99 2365-18: L 5.8 cm, W 0.8 cm; green core, coloured layers, prunts decoration, triangular section;* **g.** *SHR 99 2365-10: L 6.4 cm, W 0.4 cm; green core, coloured layers, prunts decoration, triangular section;* **h.** *SHR 99 2353-12: L 5.8 cm, W 0.8 cm; green-blue core, coloured layers, marvered decoration, triangular section;* **i.** *SHR 3029-1: L 4.2 cm, W 1.2 cm; green core, coloured layers, marvered decoration, flat section;* **j.** *SHR 97 2072-4: L 3 cm, W 0.7 cm green core, coloured layers, eyes decoration, flat section;* **k.** *SHR 99 2420: L 1.4 cm, W1.2 cm; green core, coloured layers, trip decoration, flat section;* **l.** *SHR 99 2292: L 4.8 cm, W 0.5 cm; green core, coloured layers, trip decoration, flat section;* **m.** *SHR 97 2071: L 7.4 cm, W 0.7 cm; green core, bi-chrome decoration, ogival section;* **n.** *SHR 99 2366: L 6.3 cm, W 0.5 cm; green core, bi-chrome decoration, pointed section;* **o.** *SHR 97 2085: L 4.5 cm, W 0.3 cm; green core, bi-chrome decoration, ogival section;* **p.** *SHR 99 2375: L 2.5 cm, W 0.9 cm; dark core, twisted decoration, round section;* **q.** *SHR 99 2402: L 4.2 cm, W 0.5 cm; dark core, twisted decoration, round section;* **r.** *SHR 97 2073: L 5.7 cm, W 0.7 cm; green core, bi-chrome decoration, flat section;* **s.** *SHR 99 2283: L 5.4 cm, W 0.6 cm; green core, bi-chrome decoration, pointed section;* **t.** *SHR 97 2089: L 7.3 cm, W 1 cm; green core, bi-chrome decoration, flat section.*

dark green paste. Of the bangles, 85% (Fig. 4) can be dated by their context to the sixteenth to seventeenth centuries (Phases 7 and 8), although a few were found in the levels of earlier Phases 5 to 6, and can be dated from the thirteenth to fourteenth centuries. Their diameters are between 0.5 cm and 0.9 cm, with one exception of 1.2 cm.

Two sub-groups are identified. Firstly, prunts (i.e. small blobs of glass that are fused to another piece of glass) on triangular-section bangles (sixty-six examples) (Fig. 4/a, b) have two variants: a single band of prunt on a triangular section and a "crumbly decoration" on a triangular section, both variants having mostly yellow, green, or red layers on each side.

Secondly, a bi-chrome decoration (twenty-five

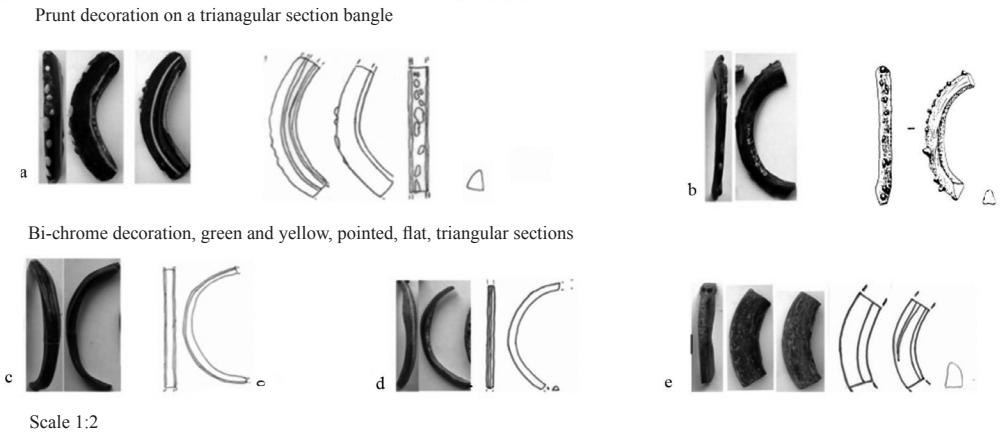

Figure 4. *Common polychrome bangles (sixteenth–seventeenth centuries).*
a. *SHR 99 2365-18: L 5.8 cm, W 0.8 cm; description as above: Fig. 3/f;* **b.** *SHR 99 2365-10: L 6.4 cm, W 0.4 cm; description as above: Fig. 3/g;* **c.** *SHR 97 2089: L 7.3 cm, W 0.6 cm; description as above: Fig. 3/t;* **d.** *SHR 99 2283-7: L 5.6 cm, W 0.4 cm; description as above: Fig. 3/s;* **e.** *SHR 97 2085: L 4.8 cm, W 1.3 cm; description as above: Fig. 3/o.*

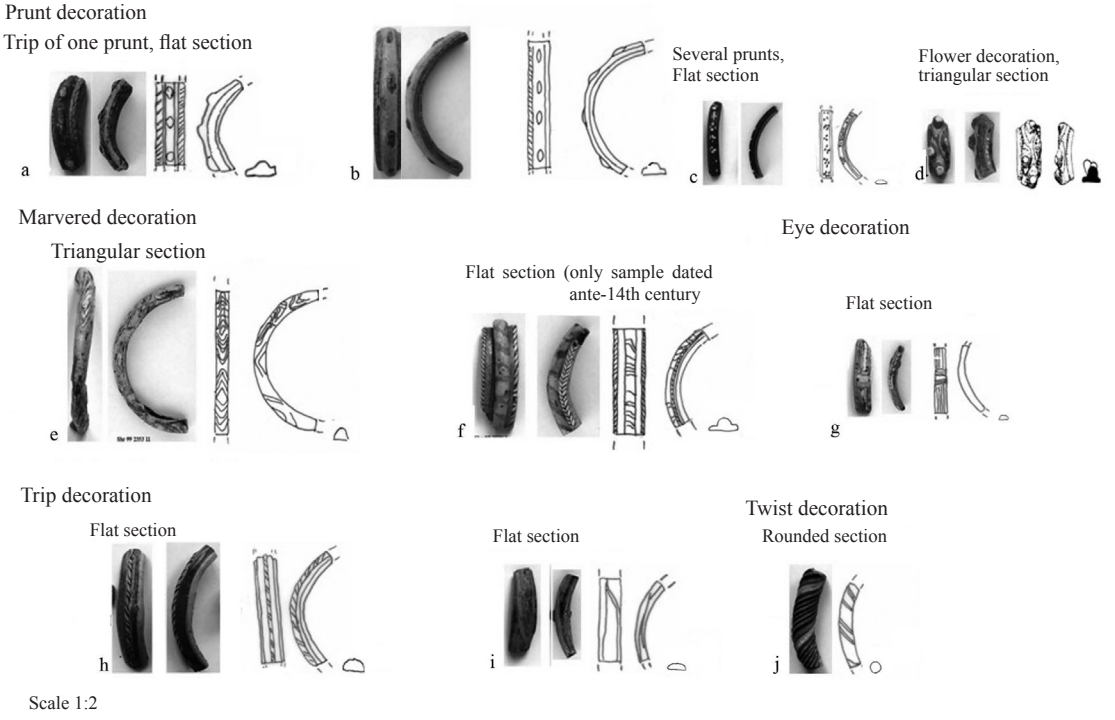

Figure 5. *Single polychrome samples (sixteenth–seventeenth centuries).*
a. *SHR 99 2370-1: L 3.8 cm, W 0.9 cm; description as above: Fig. 3/c;* **b.** *SHR 97 2064-1: L 6.3 cm, W 1 cm; description as above: Fig. 3/d;* **c.** *SHR 99 2370-3: L 3.8 cm, W 0.9 cm; blue glass, white decoration, flat section;* **d.** *SHR 97 2079-1: L 2.7 cm, W 1 cm; description as above: Fig. 3/a;* **e.** *SHR 99 2353-12: L 6.3 cm, W 0.5 cm; description as above: Fig. 3/h;* **f.** *SHR 3029-1: L 4.2 cm, W 1.2 cm; description as above: Fig. 3/i;* **g.** *SHR 99 2072: L 3.3 cm, W 0.5 cm; description as above: Fig. 3/j;* **h**. *SHR 99 2292-1: L 4.8 cm, W 0.5 cm; description as above: Fig. 3/l;* **i.** *SHR 99 2420: L 2.6 cm, W 2.5 cm; green glass, trip of glass applied, flat section;* **j.** *SHR 99 2375: L 3.1 cm, W 0.4 cm; description as above: Fig. 3/p.*

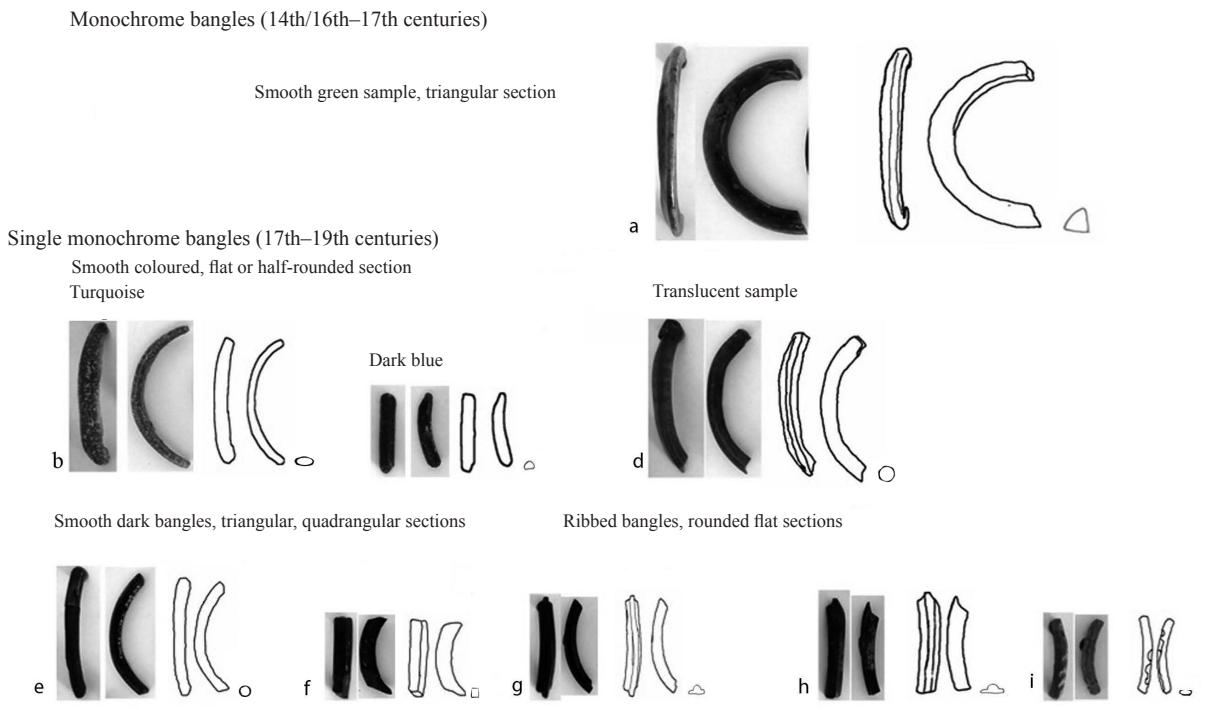

Figure 6. *Monochrome bangles (fourteenth–nineteenth centuries).*
a. *SHR 97 2023-1: L 8 cm, W 0.9 cm; green glass, ogival section;* **b.** *SHR 99 2417: L 6.2 cm, W 0.7 cm; blue turquoise glass, flat section;* **c.** *SHR 97 2023-3: L 2.5 cm, W 0.4 cm; marine blue glass, flat section;* **d.** *SHR 99 2282: L 4.5 cm, W 0.3 cm; translucent brown glass, flat section;* **e.** *SHR 97 2130: L 5.2 cm, W 0.2 cm; dark glass, flat section;* **f.** *SHR 99 2246: L 3.8 cm, W 1.9 cm; dark glass, quadrangular section;* **g.** *SHR 99 2297-2: L 4.2 cm, W 2.1 cm; dark glass, flat section;* **h.** *SHR 99 2292-9: L 3.3 cm, W 1.6 cm; dark glass, flat section;* **i.** *SHR 97 2088-2: L 3.4 cm, W 1.6 cm; blue light, vertical ribs, flat section.*

examples) displaying at least three variants, with a range of colours between a green core and layers of yellow glass (Fig. 4/c–e), is found on a range of thick or thin bangles. They are flat and pointed, with a triangular section. Fifteen per cent (sixteen samples) (Fig. 5/a–c) of the polychrome bangles are what we call "single" types, i.e. unique, with no more than one example of each type. These can be dated to the sixteenth to nineteenth centuries (Phases 7 to 9). Five different patterns have been identified: first, with prunt decoration on a flat or triangular section, including variants such as crumbly or flower decoration (Fig. 5/c, d); second, marvered decoration (i.e. hot decoration caused by coloured glass threads/trails fused in glass) (Fig. 5/e, f); third, eye decoration (one sample); the fourth style has a band/strip of glass (Fig. 5/g, h) decoration; the fifth and last group consists of twisted bangles. The polychrome bangles are large, around 0.8 cm in diameter and 1.4 cm thick.

The monochrome bangles (42%, eighty samples) (Fig. 6)

The majority, 89% (seventy-one samples), are smooth, thick, plain green bangles, with a large triangular section of 0.9 cm (Fig. 6/a). They can generally be dated to the seventeenth century, although a few can be attributed, by their context, to the fourteenth century. We also found a group of eight very thin bangles (Fig. 6/b–i) some of which could be dated to the sixteenth century and the majority to the seventeenth to nineteenth centuries. One is dark blue with a round section, another turquoise with a flat section, a third is translucent brown with a half-rounded section, and five are of dark paste of which two show vertical ribs on the surface.

This corpus of bangles reflects different stylistic schools, but the various styles do not reflect different dates. This is clear in the examples (Fig. 7) for the finds from inventory groups 2370, 2292, and 2023, where we find

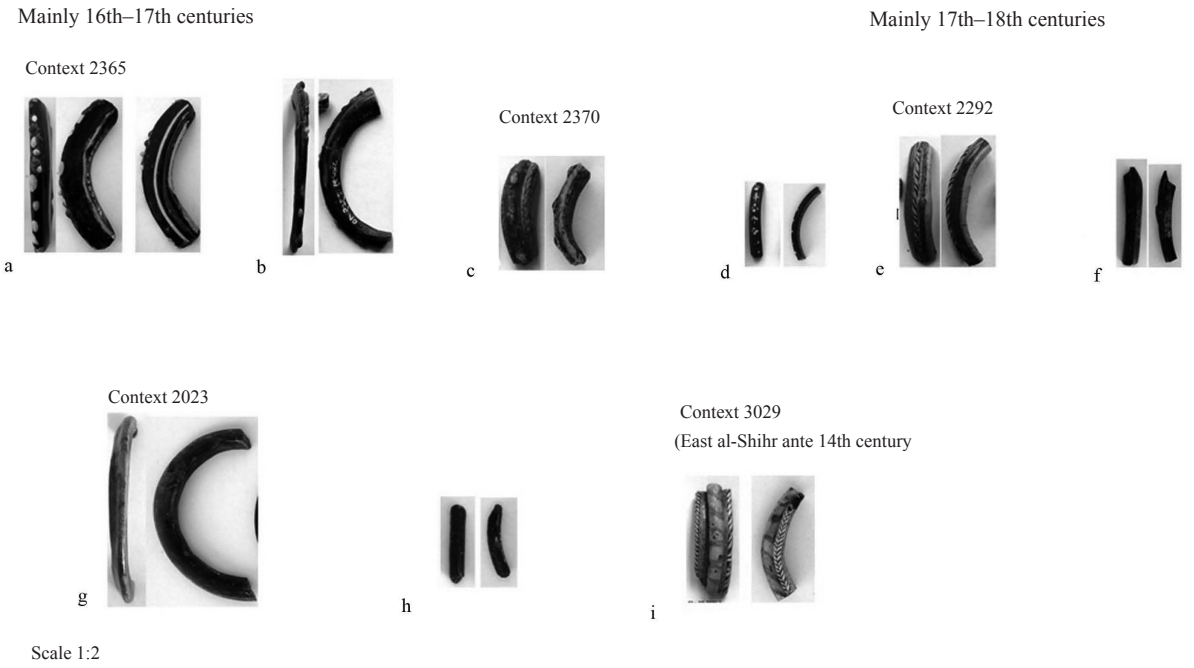

Figure 7. *Some bangles classified by context.*
a. *SHR 99 2365-18: L 5.8 cm, W 0.8 cm; description as above: Fig. 3/f;* **b.** *SHR 99 2365-10: L 6.4 cm, W 0.4 cm; description as above: Fig. 3/g;* **c.** *SHR 99 2370-1: L 3.8 cm, W 0.9 cm; description as above: Fig. 3/c;* **d.** *SHR 99 2370-3: L 3.7 cm, W 0.3 cm; description as above: Fig. 5/c;* **e.** *SHR 99 2292-1: L 4.8 cm, W 0.5 cm description as above: Fig. 3/l;* **f.** *SHR 99 2292-2: L 3.3 cm, W 1.6 cm; dark paste, flat section;* **g.** *SHR 97 2023-1: L 8.5 cm, W 0.4 cm; green core, description as above: Fig. 6/a;* **h.** *SHR 97 2023-3: L 2.5 cm, W 0.2 cm; blue core, round section; description as above: Fig. 6/c;* **i.** *SHR 3029-1: L 4.2 cm, W 1.2 cm; description as above: Fig. 3/i.*

different typological groups in the same archaeological context and levels.

Comparative data on style and technique

Some parallels may be established with bangles found in medieval and later levels of archaeological sites of Yemen and India, the Near East, and the Red Sea region that provide interesting comparative data.

Kawd am-Saylāʾ, al-Qarū (Abyan area oasis), Yemen, Gulf of Aden (seventeenth century) (Fig. 8)

Kawd am-Saylāʾ is located near Aden, between Shaykh ʿUthmān and Laḥj. It has been the focus of many investigations since the 1940s: by A. Lane & R.B. Serjeant (1948: 108–133); D.B. Doe (1963: 150–162); T. Monod (1978: 110–124); D. Whitcomb (1988: fig. 21); and C. Hardy-Guilbert & A. Rougeulle (1997: 147–196). Much pottery and glass vessel sherds, as well as slag and glass bangles have been found. Monod registered 156 bangles and proposed a *terminus ad quem* of the seventeenth century, at the latest. The production is very similar to that identified at al-Shiḥr, especially the prunts, bi-chrome bangles, and the plain green collection (Fig. 8/a–c), as well as single polychrome and dark monochrome smooth and ribbed bangles.

Kholāpur (fourteenth–seventeenth centuries)

Kholāpur is located in the western part of south India, near the sixteenth meridian. This site was investigated by H.D. Sankalia and M.B. Dikshit who published a report in 1952 with a small section on bangles (1952: 1–8, 115–121). Some of the items assigned to the Bahmani period (*aka* Bahmanid empire) (fourteenth–sixteenth centuries) are very similar to our corpus. The Bahmani empire was founded in 1347 by ʿAlāʾ al-Dīn Ḥasan, Bahman Shāh (Wolseley 1924: 73–80).

We can thus compare both corpuses for their prunts and coloured layers on both sides, and for the green and yellow bi-chrome examples, as well as the green monochrome bangles. All the Bahmani period bangles are said to be the work of Muslim Bahmani glassmakers,

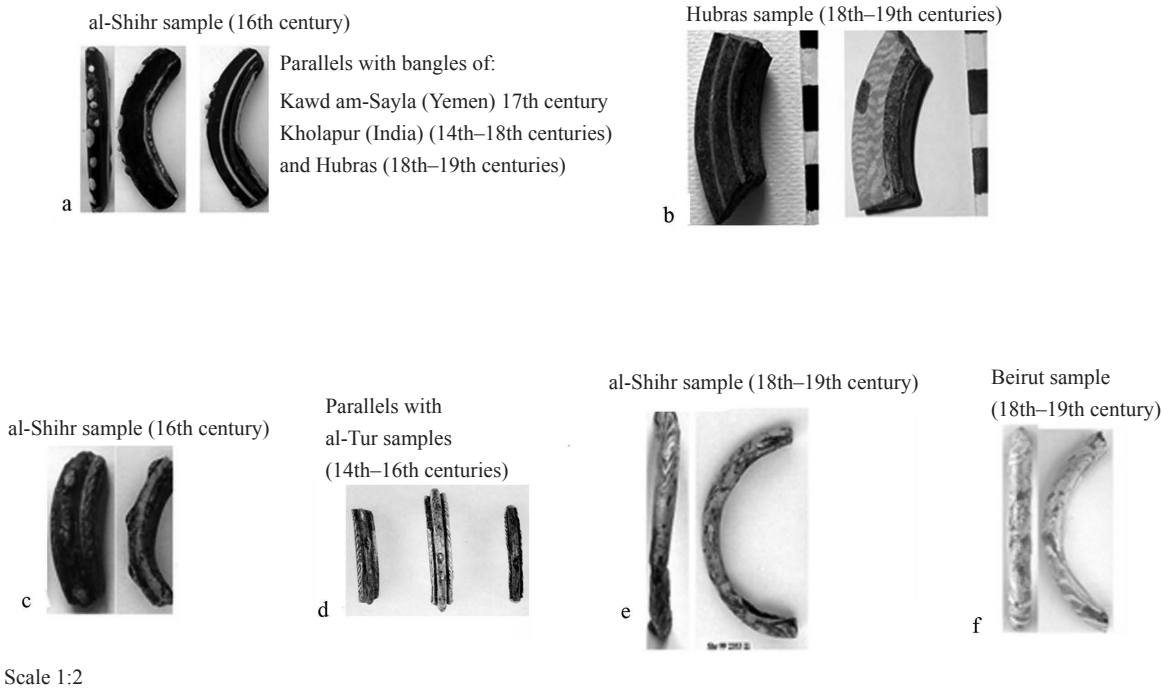

Figure 8. *Polychrome bangles parallel data.*
a. *SHR 97 2088-2: L 3.4 cm, W 1.6 cm; description as above: Fig. 6/i;* **b.** *HUBRAS: HM.06.A3.1.2. L 4.5 cm, W 1.3 cm; black core, triangular in section;* **c.** *SHR 99 2370-1: L 3.6 cm, W 1 cm; description as above: Fig. 3/c;* **d.** *TUR: TO 161, TO 1146, TO 1804 (Shindo 2009: pl. 30);* **e.** *SHR 99 2353-12: L 5.8 cm, W 0.8 cm; description as above: Fig. 3/h;* **f.** *BEYROUTH no. 32: Boulogne 2007, 097 004 008; L 5.1 cm, W 0.5 cm.*

and some remains of a workshop area were found (Sankalia & Dikshit 1952). The excavators explained that the techniques of superposed coloured glass layers were introduced by the Muslims (1952; Sankalia 1947: 252–259). This type was also found at Julfār, in the Emirates and has been attributed to India or Iran (Hardy-Guilbert 1991: 161–203; Hansman 1985: 76–83). Otherwise, items from Kholāpur (Brahmapuri) are described as different from other Indian bangles discovered, mainly because of the layer technique. Monochrome bracelets were excavated: dark coloured, light brown translucent; and turquoise bangles were registered. Such bangles are common in many levels in different Indian archaeological sites; we know, for example, of an interesting corpus from Kopia (Kanungo & Brill 2009: 11–25).

Near East: Ḥubrāṣ (Jordan), Beirut, and Damascus, late Ottoman period (eighteenth–nineteenth centuries)

The same decorative technique of coloured layers on a triangular section bangle is found on one of ten bangles discovered at Ḥubrāṣ, in northern Jordan (excavated by B. Walker, studied by S. Boulogne, 2007), that can be dated to late Ottoman times (Fig. 8/b).[3] Other comparative data may be found for the marvered white and yellow bangle of triangular section in our assemblage (sample SHR 2353–12). An almost identical example was discovered in a trading area in the upper archaeological levels of the Ottoman *sūq* in the Beirut excavations (Curvurs & Stuart 1998–1999: 167–205 and unpublished material) (Fig. 8/f). From the same levels came some amber and translucent brown twisted glass bangles, smooth dark turquoise blue ones, and a ribbed example. Some turquoise and black examples were also found in the Damascus citadel (Boulogne 2008: 127–154) (excavation report by S. Berthier [in preparation]; study by S. Boulogne [2007; 2008], and in Masyāf castle in Syria, mainly of later date (Boulogne 2007; 2008); excavations under the direction of Hathan, Direction Générale des Antiquités et Musées syriens) (Fig. 9/b, c).

[3] The Ḥubrāṣ bangles are published by S. Boulogne (Walker *et al.* 2007: 429–470).

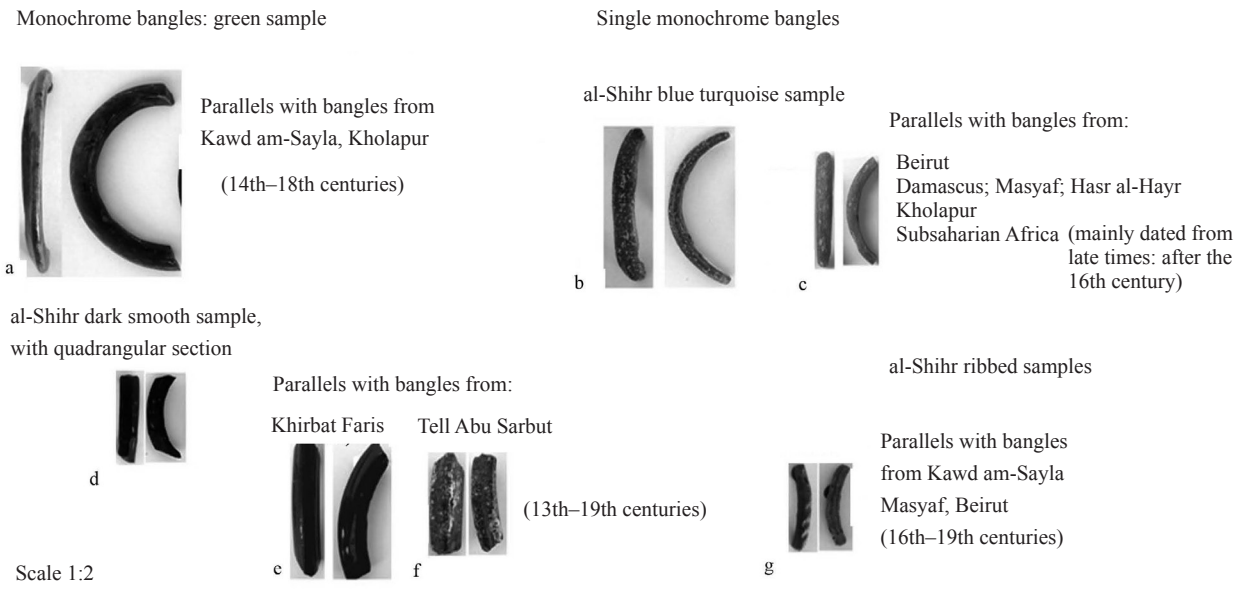

Figure 9. *Monochrome bangles parallel data.*
a. *SHR 97 2023-1: L 8 cm, W 0.2 cm; description as above: Fig. 6/a;* **b.** *SHR 99 2417: L 5.2 cm, W 0.7 cm; description as above: Fig. 6/b;* **c.** *BEY 097 004 008: L 5.1 cm, W 0.3 cm; blue glass, flat section;* **d.** *SHR 99 2246: L 3.9 cm, W 1.9 cm; description as above: Fig. 6/f;* **e.** *KHIRBAT FARIS no. 418:Boulogne 2007; 150 1 SG 1045 P19; 3.5 cm, 0.7 cm;* **f.** *TELL ABU SARBUT no. 326: Boulogne 2007; L 3.9 cm W 0.4 cm;* **g.** *SHR 97 2088-2: L 3.4 cm W 1.6 cm; description as above: Fig. 6/i.*

An interesting corpus of dark, smooth bangles was discovered in central Jordan, at Khirbat Fāris and at Tell Abū Sarbūṭ. Chemical analysis of these has revealed an interesting component that suggests an Indian or south-east Asian provenance, mixed with local elements (Boulogne & Henderson 2009: 53–75).

Red Sea region: al-Ṭūr, ᶜAydhāb, Quṣayr al-Qadīm, Mērgēbla, and Mekaᵓika (twelfth–eighteenth centuries)

A few parallels can be drawn to Red Sea region examples. A kind of bangle with a band of prunt is clearly identified in the finds from al-Ṭūr (Sinai) where a total of 3000 bangles were uncovered. These can be dated to the Mamlūk and Ottoman periods (Fig. 8/d) (Shindo 2001: 73–100; 2009: pl. 30). Others come from ᶜAydhāb, where sixty-two bangles were found (Shindo 1996), and Quṣayr al-Qadīm (Meyer 1983; 1992).

Similar samples to those of SHR 3029–1 (Fig. 5/f), dated to the thirteenth and fourteenth centuries were noted among the discoveries in Mērgēbla and Mekaᵓika near Assab in Eritrea; one is dated to the eighteenth century and from the Eritrean coast (Monod 1975: 703–718). Smooth, dark turquoise bangles were also found at al-Ṭūr.

The comparative data shows us that many of the al-Shiḥr bangles are similar to those from Kawd am-Saylāᵓ (Yemen, seventeenth century), and both have a large group of decorative elements that are like those found at Kholāpur, India (fourteenth–sixteenth century). We also found some interesting comparisons with other decorative elements from the Bilād al-Shām, but very few with those from the Red Sea region.

The question of local production versus glass imports

Medieval textual sources and ethnographic data will be used to discuss the question of local production in Shiḥr and Kawd am-Saylāᵓ versus imports from India, the Near East, and Europe, alongside previously outlined parallels, as mentioned above.

Local manufacturing at al-Shiḥr and Kawd am-Saylāᵓ mixed with Indian imports from the thirteenth to seventeenth centuries (Fig. 10)

At Kawd am-Saylāᵓ, the authors suggest that there was local glass-working. This was based on the discovery of slag and finds of glass vessels. There are numerous

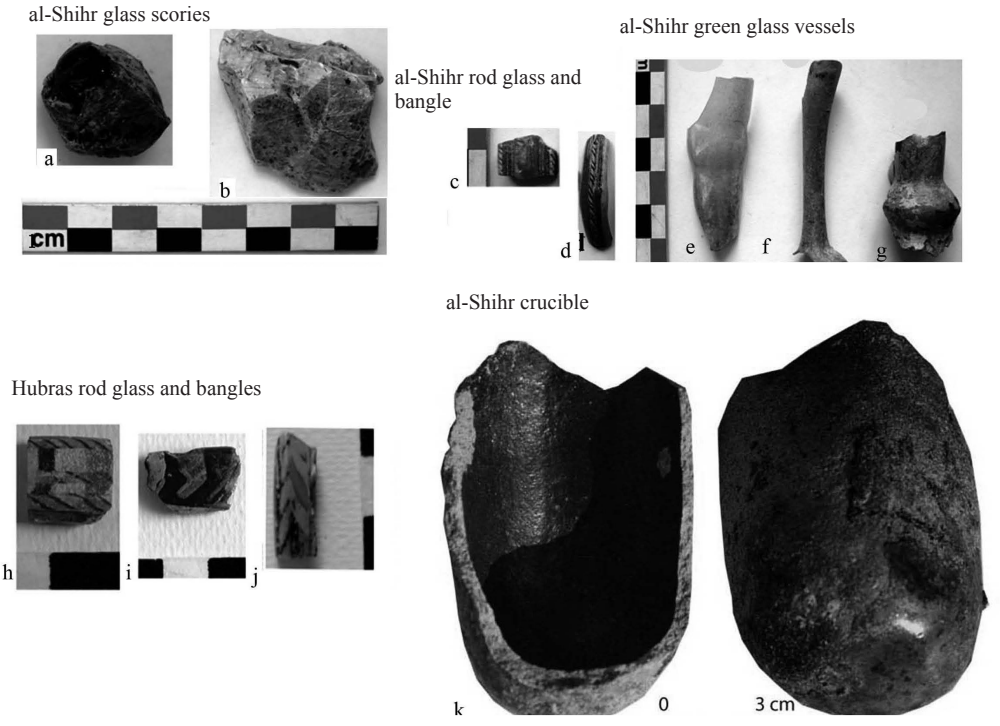

Figure 10. *Archaeological evidence of local manufacturing at al-Shiḥr.*
a. *SHR 97 2130: blue slag, L 2.9 cm, W 3.5 cm;* **b.** *SHR 99 2260: purple and green slag, L 2.4 cm, W 2.2 cm;* **c.** *SHR 99 2420: rod glass, L 1.5 cm, W 1.1 cm; green paste, yellow, red, black, and white layers, flat section;* **d.** *SHR 99 2292: glass bangle, L 4.7 cm, W 0.6 cm; description as above;* **e.** *SHR 99 2366: L 4.9 cm, W 1.1 cm; neck of green opaque glass;* **f.** *SHR 99 2362: l. 5.6 cm, W 0.7 cm; neck of green opaque glass;* **g.** *SHR 99 2283: 3.2 cm, 2.5 cm; neck of green opaque glass;* **h.** *HUBRAS: R1, rod glass, L 1.4 cm, W 1.5 cm; translucent core, coloured layers;* **i.** *HUBRAS: R.39, L 2 cm, W 0.6 cm; translucent core, coloured layers;* **j.** *HUBRAS: R16, L 2.7 cm, W 0.7 cm; translucent core, coloured layers;* **k.** *SHR 99 2345: crucible, L 9.2 cm, W6.4 cm.*

parallels between the bangles from both sites (al-Shiḥr and Kawd am-Saylāʾ, as explained above). Monod's investigations described the activity of workshops at Kawd am-Saylāʾ. In her work on Aden, and on the basis of the study of the thirteenth-century manuscripts of Ibn al-Mujāwir (*Taʾrīkh al-mustabṣir* i: 148) and of the sixteenth-century al-Ṭayyib Bā (Abū) Makhrama (*Taʾrīkh taghr ʿadan* i: 21), R.E. Margariti explains (2007: 60–63) that al-Lakhaba, near Aden, had been the main location of glass production for a long time. She adds that, "Kawd Am Sayla lies about nine kilometres from Aden, a distance that roughly corresponds to Abu Makhrama's 1.75 farsakh" (2007: 67). As for glass paste known as "Malipa", it is mentioned in the thirteenth century in the Chu Fan Shi among the products from Ḥaḍramawt (Chu Ju Kua 1912). At al-Shiḥr, a workshop was discovered in Phase 7 (sixteenth century), containing two samples of glass slag (Fig. 10/a, b) and numerous crucibles[4] (Fig. 10/k) (SHR 99 2345–2; Hardy-Guilbert 2005: 71, 73; Hardy-Guibert & Ducatez 2004: 128–130, 142). Another element which supports the hypothesis of a local production of glass bangles at al-Shiḥr is a rod of glass with the same patterns as a single polychrome bangle (Fig. 10/c, d; SHR 2420, 2292) discovered in Eritrea (Monod 1975). This kind of decorated glass rod was also found among the finds of Ḥubrāṣ in Jordan (Fig. 10/h–j). This may suggest an itinerant secondary workshop or a trade in decorated rod glass, which would then be reworked and the object completed at

[4] We would like to thank Aude Mongiatti, science curator at the British Museum, and Andrew Meek, scientist at the British Museum and PhD student under Professor J. Henderson at Nottingham University, for their interest in the scientific analyses of vitreous material from crucibles.

its destination. The use of the same green paste for bangles as for undecorated and decorated vessels may suggest a single provenance for all the al-Shiḥr material, either from the site of al-Qarū or of Kawd am-Saylāʾ (Doe 1963; Lane & Serjeant 1948).

Interpretation of parallels with India, imports or stylistic influences from the fourteenth to seventeenth centuries

The exchanges between India and Yemen are verified by primary sources from the Ayyubid period (1171–1250). Beads are mentioned in export registers from Sind and Daybul stating that they were exported to al-Shiḥr (Smith 1995: 127–140; Fiorani Piacentini 2003: 95–97). However, we do not have any details about the bead quality and many scholars mention the export of glass from Yemen. In the twelfth century we know of a request for glass from Aden by someone on the Malabar Coast in India (Goitein 1974: 18–35). Our dating is rather later. With regard to closely dating and comparing the many similarities between the material from al-Shiḥr and Kholāpur, we should probably think in terms of more than just imports, and perhaps in terms of the movement of craftsmen. The caste of the Indian pedlar specialized in the sale of glass bangles, known from medieval times and mentioned in a thirteenth-century manuscript,[5] may confirm this hypothesis.

Near East and Europe: Venetian imports to Yemen from the fourteenth to nineteenth centuries

The glass trade between Venice, Egypt, and the Syrian coast was very important from Ayyubid to late Ottoman times and included the raw material, vessels, and jewellery. The Portuguese presence in the Red Sea, from the beginning of the sixteenth century, should be highlighted (Chaudhuri 1985: 63–79) and may explain the presence of Venetian imports at al-Shiḥr. The white and yellow marvered example, with gold reflections found in an excavation in the Beirut suq may be related to the famous sixteenth-century gold paste mentioned by Tomé Pires: "...from Cairo ... the merchandise brought by the galleasses of Venice, to wit, many arms, scarlet-in-grain, coloured woollen cloths, coral, copper, quicksilver, vermilion, nails, silver, glass and other beads, and golden glassware" (1944: 269).

[5] The bangles are known in India from thirteenth-century primary sources (1253): Somesvara, *Surathotsava* vi, verse 165, is mentioned by Dikshit (1969: 66).

Origin of the Red Sea samples: Near East and African coast, thirteenth to nineteenth centuries

The Red Sea bangles might come from the Near East especially from the al-Khalil (Hebron) workshops in Palestine, well known from the fourteenth century for glass bangles manufacturing, or from Fusṭāṭ in Egypt (Spaer 1992: 44–62; Boulogne 2008). The importance of commercial trade in the Gulf of Aden and the Red Sea from Ayyubid times is particularly well illustrated by the Karīmī merchants (Fishel 1958: 157–174). Furthermore, the connection between the harbour of al-Shiḥr and the east coast of Africa from the eleventh century is well known through archaeological material in the form of African pottery, and the site of al-Shiḥr is also mentioned in some manuscripts as being a transit port between Asia and Africa (Hardy-Guilbert 2002: 39–53). Tuchscherer (2004: 157–163) wrote: "À la fin du 17ème siècle, les pays riverains de l'ensemble mer Rouge-golfe d'Aden commençaient à être intégrés dans leurs profondeurs dans un système complexe d'échanges qui liaient entre elles non seulement les deux rives arabe et africaine, mais aussi celles-ci avec l'Inde et la Méditerranée."

Conclusion

The main aim of this paper was to understand the manufacture of glass bangles in south Yemen through the study of a surprisingly large bangle corpus. South Yemen might well have been an important place for the manufacturing of glass and al-Shiḥr was certainly one of the centres of that manufacture. R.B. Serjeant wrote about glass bangles from al-Shiḥr in his article "The Ports of Aden and Shihr" (based on the study of the fifteenth-century primary source *Mulakhkhaṣ al-fiṭan* by al-Ḥusan b. ʿAlī al-Sharīf al-Ḥusaynī): "glass, especially polychrome bangles was manufactured in some places on the Tihāmah coast but there seems to be no allusion to these factories in the *Mulakhkhaṣ al-fiṭan* though one of them is quite near Aden" (1974: 207–224). The bangles from al-Shiḥr, like those from Kawd am-Saylāʾ, were discovered with much blue and white Asian pottery and Chinese stoneware. Al-Shiḥr is located on the South Sea Silk Road, which remained one of the most-used trade routes for glass exchange from antiquity (Brill 1993: 70–79; 2009: 109–147; Glover 1996: 57–94). No data has been found to confirm that there were any imports from Asia, and only a few parallels have been drawn with dark bangles similar to those of central Jordan. Henderson's analysis suggests that these contain some Indian and

south-east Asian components (Boulogne & Henderson 2009). Whatever else, it is clear that, with regard to glass bangles, the cultural link between south Yemen and India seems much stronger than with Bilād al-Shām or Egypt.

Some clues may lie in a study of the various colours: green in the case of glass from al-Shiḥr and Ḥaḍramawt indicates further clues as to the provenance. Connections between economic aspects and social practices are introduced: the meanings of the colours are really significant during Islamic times in the Maghreb and Near East especially in the context of textiles (Mansouri 2007). Ongoing studies on Ḥaḍramawt by M. Rodionov (2007: 19–29, 98–101, 105–106, 126–134) propose that dress varies according to traditional social strata. Are there similar parallels in the colours used for glass?

In the case of the use of green glass from al-Shiḥr and in Ḥaḍramawt, can we speak of an attempt to imitate Chinese celadon, as it is often suggested, or is there a connection with Islamic rules and traditions? This topic is the focus of another article, *Les bracelets de verre coloré d'Orient médiéval et tardif: modèles et couleurs, des marqueurs identitaires* (Boulogne, in preparation).

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